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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/274,152	MCVEIGH ET AL.
	Examiner	Art Unit
	Tung Vo	2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *06/15/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/15/06 has been entered.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 06/15/06 has been considered.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1, 12, 18, and 20 provisionally rejected on the ground of nonstatutory double patenting over claims 1, 8, and 16 of copending Application No. 09/274,157. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows: unidirectional prediction to predict the contents of a frame that is defined as a bi-directionally predicted frame by the encoding protocol being used for the stream of data.

Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

The Provisional Application 60/080,501

It is noted that the unidirectional prediction is described in the provisional application as follows.

3.1 Prediction Constraints

Before describing the actual motion estimation technique used in our encoder, we will highlight some of the constraints placed on the prediction process to reduce the computational complexity. First, for B frames, we only use unidirectional prediction. Namely, only forward or backward motion is allowed in one frame, and bi-directional prediction is forbidden. Furthermore, we always use the temporally closest reference frame for the prediction since it is likely to be the most similar to the frame to be encoded. This prediction structure is shown in the figure below.

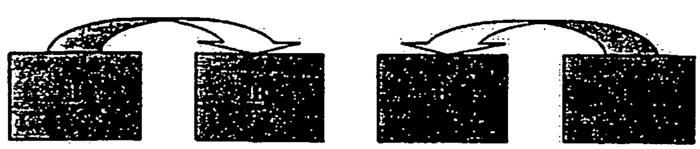

Figure 1. Temporally closest reference frame constraint.

If the sequence contains interlaced content, we only allow even parity field prediction. In other words, we predict the top field from the top reference field and the bottom field from the bottom reference field (see Figure 2). This constraint eliminates the exhaustive searching for the best vector between frame and field motion and the various field parities while still yielding reliable and accurate motion vectors. Finally, for progressive content with only P frames, we do not perform dual-prime prediction.

Specification

5. A careful review of the specification, it has been found that the specification discloses "I-frames are encoded based ***only*** on the content within the frame itself and are typically used as reference and synchronization frames.", para. [0011]; "the transformation to the frequency domain need ***only*** be performed on the lower frequency 4.times.8 pixels of the block (i.e., the left half of the 8.times.8 block).", para. [0048]; "In accordance with one embodiment of the present invention, ***only*** the left-side, i.e., the low-frequency components, of the DCT transformed block are quantized, thereby increasing throughput by a factor of two.", para. [0049]; "while using only a fraction of the normal computational requirements.", para. [0060]; "In one embodiment, this residual is calculated ***only*** over even-numbered lines to reduce computational complexity.", para. [0066]. The specification shows the unidirectional prediction using the temporal closest anchor frame, wherein the temporally closest anchor frame is I or P frame, para. [0059].

There is no disclosure of "***only*** the temporally closest anchor frame" for unidirectional prediction. Therefore, the following rejections are best understand.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Igarashi et al. (US 5,539,466) in view of Ju (US 5,801,778).

Noted paragraph [0059] of the specification discloses “Graphically, the temporally constrained, unidirectional interpolation of a B-frame is presented with reference to FIG. 10. As shown in FIG. 10, rather than bidirectionally interpolating the content of B-frame 1004 from past and future anchor frames, ***the content of B-frame 1004 is unidirectionally interpolated by the closest anchor frame, i.e., I-frame 1002***, in accordance with one aspect of the present invention. Similarly, ***B-frame 1006 is unidirectionally interpolated from the temporally closest anchor frame, P-frame 1008***, in accordance with this aspect of the present invention. As shown, inter-frame encoding of P-frame 1008 is premised on the nearest past anchor frame, in this example, I-frame 1002.”

Forward prediction or backward prediction is unidirectional prediction for predicting a bidirectional frame or picture as known B frame or B picture.

It is known that MPEG standard contains reference frames called anchor frames as inter (I) frame and predicted (P) frame, and bidirectional (B) frame. Wherein the MPEG-2 standard discloses each 16.times.16 pixel block of a "B" Bidirectional Picture can be coded by forward prediction from the closest past "I" or "P" Picture, by backward prediction from the closest future "I" or "P" Picture, **or** bidirectionally, using both the closest past "I" or "P" picture and the closest "future "I" or "P" picture. Full bidirectional prediction is the least noisy prediction (see fig. 1 of Ngai).

Re claims 1, 12, 18 and 20, Igarashi discloses an apparatus comprising: a motion estimation circuit (20, 21 and 22 of fig.1) to receive a stream of data comprising at least an anchor frame and a predicted frame, and to utilize even-parity field prediction to unidirectional predict (col. 10, lines 58-67) content of each of a plurality of fields of the predicted frame from corresponding fields of only a temporally closest anchor frame in the stream of data (figs. 7-12, e.g. predicting a frame using unidirectional predict content each of a plurality of fields (odd fields or even fields), and the storage medium or computer comprises a plurality instructions to execute the function above (Note Here, storage media subject to this system are media having a continuous transfer rate (speed) of about 1.5M bps. (bits per second) such as a so called CD (Compact Disk), a DAT (Digital Audio Tape Recorder), or a hard, disk, etc. These media are not only directly connected to a decoder, but also are assumed to be connected thereto through transmission media such as a bus of a computer, a LAN (Local Area Network), or a telecommunication link, etc. Further, not only reproduction in forward direction, but also special functions such as random access, high speed reproduction, or reproduction in backward direction, etc. are taken into consideration).

It is noted that Igarashi suggests a forward prediction is considered as unidirectional prediction using a former frame (anchor or reference frame) to predict a current frame (P or B frame) (fig. 17). However, Igarashi does not particularly teach the unidirectional predicted frame composes a fame that is defined as a bi-directionally predicted frame according to an encoding protocol for the stream of data using only unidirectional prediction as claimed.

However, Ju suggests B frames can contain macroblocks which are (a) intracoded, (b) unidirectional forward predictive coded, (c) unidirectional backward predictive coded using

temporal encoding relative to a subsequent reference frame, **or (d)** bidirectionally predictive coded using temporal encoding relative to both previous and subsequent reference frames.

Wherein B frame macroblock may be predicted from a macroblock of an I frame or a P frame, but no predictions are made from B frame macroblocks, which means Ju would obviously predict B frame using either (b) unidirectional forward predictive coded or (c) unidirectional backward predictive coded using temporal encoding relative to a subsequent reference frame to predict a B frames in a field prediction mode (MPEG-2 standard encoder, see col. 2, lines 17-50).

Therefore, taking the teachings of Igarashi and Ju as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the teachings of Ju into the apparatus of Igarashi to predict the B frame using the unidirectional of the closet anchor frame. Doing so would allow the apparatus to reduce the computation requirements and improve the coding efficiency.

Re claims 2 and 15, Igarashi further teaches wherein the motion estimation circuit predicts content of a first in the predicted frame from content of a corresponding first field in the anchor frame and a first field motion vector, and predicts content of a second field in the predicted frame from a corresponding second field and a second field motion vector (McoPe, McePo of fig. 10A).

Re claim 3 and 14, Igarashi further teaches wherein the motion estimation circuit measures activity content within each of the plurality of fields of the anchor frame to generate a corresponding plurality of motion vectors (figs. 11, e.g. BMVoBo, MvePo...)

Re claims 4 and 13, Igarashi further teaches wherein the anchor frames used either precede or supersede the predicted frame depending on predicted frame type (figs. 10(A), 10(B), and 11; e.g. MCP, FMVB, MP, BMVB, SMVI, SMVP).

Re claims 5 and 16, Igarashi further teaches wherein the predicted frame and anchor frame are comprised of interlaced video content (figs. 5(A)- 5(C), wherein a first field of each of the predicted frame and the anchor frame contain even-field interlaced video content, while a second field of each of the predicted fame and the anchor frame contain odd-field interlaced video content (fig. 7, ODD FIELD AND EVEN FIELD).

Re claim 6, Igarashi further teaches wherein a first field of the predicted frame and the anchor frame comprises even-field content of the interlaced video content, and a second field of the predicted frame and the anchor frame comprises odd-field content of the interlaced video content (fig. 7)

Re claim 7, Igarashi further teaches wherein a first field of the predicted frame comprises even-field content of the interlaced video content and a first field of the anchor frame comprises odd-field content of the interlaced video content (Ie to Pe of figs. 10(A) and 10(B)).

Re claim 8, Igarashi further teaches wherein a first field of the predicted frame comprises odd-field content of the interlaced video content and a first field of the anchor frame comprises even-field content of the interlaced video content (Io to Pe of figs. 10 (A) and 10(B)).

Re claims 9 and 17, Igarashi further teaches wherein motion estimation circuit generates a motion vector for each of a first and second field of the predicted frame by measuring a sum of absolute activity differences in a corresponding first and second field of the anchor frame (22 and 21 of fig. 1, e.g. a frame motion detection circuit 22 and a field motion detection circuit 21, which serve as motion detection means for detecting, every macro block, motion vectors between frames and a sum of differences of absolute values of respective pixels, and for detecting, every macro block, motion vectors between fields obtained by dividing a frame in

dependency upon odd and even scans of pixels and a sum of differences between absolute values of pixels, respectively).

Re claim 10, Igarashi further discloses wherein even-field interlaced video content of the predicted frame is predicted from even-field interlaced video content of the anchor frame, and odd-field interlaced video content of the predicted frame is predicted from odd-field interlaced video content of the anchor frame (figs, 10(A), e.g. MCePe, McoPo).

Re claims 11 and 19, Igarashi further teaches wherein the even-field interlaced video content of the predicted frame is predicted from the even-field interlaced video content of the anchor frame and a motion vector (figs. 10(A), 20(B) and 11), wherein the motion vector is determined by measuring a sum of.absolute differences within the even-field interlaced video content of the anchor frame (21 and 22 of fig. 1).

Re claims 24-31, see analysis in claims 1-5, and 9-11.

Re claims 21-23 and 32-37, Igarashi further teaches MPEG standard contains I, B, P frames and the anchor frame is one of an I-frame or a P-frame (cols. 17-20).

2. Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Igarashi et al. (US 5,539,466) in view of Ngai et al. (US 5,650,823).

Re claims 1, 12, 18, and 20, Igarashi teaches a method for performing motion estimation comprising:

Receiving a stream data (fig. 4) comprising at least a predicted frame (P or B frame of fig. 4, where P or B frame is considered as current frame) and temporally closest anchor frame (I frame of fig. 4, wherein I frame is considered as a former frame of fig. 17), utilizing even parity

field (odd and even fields within former frame of fig. 17) prediction to unidirectionally predict (forward prediction, fig. 17, col. 10, lines 26-29) content of each of plurality of fields of the unidirection predicted frame (current frame) from corresponding fields (odd fields or even fields) of only the temporally closest anchor frame (former frame of fig. 17), wherein the unidirectionally predicted frame comprises a frame (current frame).

It is noted that Igarashi does not discloses unidirectional predicted frame comprises a frame that is defined as a bi-directionally predicted frame according to an encoding protocol for the stream of data.

However, Ngai teaches a bi-directionally predicted frame according to an encoding protocol for the stream of data (col. 2, lines 46-52) by forward prediction (unidirectional prediction) from the closest past "I" or "P" Picture (the temporally closest anchor frame), by backward prediction (unidirectional prediction) from the closest future "I" or "P" Picture (the temporally closest anchor frame), **or** bidirectionally, using both the closest past "I" or "P" picture and the closest "future "I" or "P" picture.

Taking the teachings of Igarashi and Ngai as whole, it would have been obvious to one of ordinary skill in the art to modify the teachings of Ngai into the method of Igarashi in order to provide a reduced requirement for memory bandwidth in bidirectionally coding pictures.

It is note that the combined method above would be implemented on a computer or stored on a storage with instructions (21 of fig. 3, Ngai).

Re claims 2-11, 13-17, 19, 21-37, Igarashi further teaches wherein the motion estimation circuit predicts content of a first in the predicted frame from content of a corresponding first field in the anchor frame and a first field motion vector, and predicts content of a second field in the

predicted frame from a corresponding second field and a second field motion vector (McoPe, McePo of fig. 10A); wherein the motion estimation circuit measures activity content within each of the plurality of fields of the anchor frame to generate a corresponding plurality of motion vectors (figs. 11, e.g. BMVoBo, MvePo...); wherein the anchor frames used either precede or supersede the predicted frame depending on predicted frame type (figs. 10(A), 10(B), and 11; e.g. MCP, FMVB, MP, BMVB, SMVI, SMVP); wherein the predicted frame and anchor frame are comprised of interlaced video content (figs. 5(A)- 5(C), wherein a first field of each of the predicted frame and the anchor frame contain even-field interlaced video content, while a second field of each of the predicted fame and the anchor frame contain odd-field interlaced video content (fig. 7, ODD FIELD AND EVEN FIELD); wherein a first field of the predicted frame and the anchor frame comprises even-field content of the interlaced video content, and a second field of the predicted frame and the anchor frame comprises odd-field content of the interlaced video content (fig. 7); wherein a first field of the predicted frame comprises even-field content of the interlaced video content and a first field of the anchor frame comprises odd-field content of the interlaced video content (Ie to Pe of figs. 10(A) and 10(B)); wherein a first field of the predicted frame comprises odd-field content of the interlaced video content and a first field of the anchor frame comprises even-field content of the interlaced video content (Io to Pe of figs. 10 (A) and 10(B)); wherein motion estimation circuit generates a motion vector for each of a first and second field of the predicted frame by measuring a sum of absolute activity differences in a corresponding first and second field of the anchor frame (22 and 21 of fig. 1, e.g. a frame motion detection circuit 22 and a field motion detection circuit 21, which serve as motion detection means for detecting, every macro block, motion vectors between frames and a sum of differences

of absolute values of respective pixels, and for detecting, every macro block, motion vectors between fields obtained by dividing a frame in dependency upon odd and even scans of pixels and a sum of differences between absolute values of pixels, respectively); wherein even-field interlaced video content of the predicted frame is predicted from even-field interlaced video content of the anchor frame, and odd-field interlaced video content of the predicted frame is predicted from odd-field interlaced video content of the anchor frame (figs, 10(A), e.g. MCePe, McoPo); wherein the even-field interlaced video content of the predicted frame is predicted from the even-field interlaced video content of the anchor frame and a motion vector (figs. 10(A), 20(B) and 11), wherein the motion vector is determined by measuring a sum of absolute differences within the even-field interlaced video content of the anchor frame (21 and 22 of fig. 1); MPEG standard contains I, B, P frames and the anchor frame is one of an I-frame or a P-frame (cols. 17-20).

Response to Arguments

3. Applicant's arguments filed 06/15/2006 have been fully considered but they are not persuasive.

The applicant argued that neither Igarashi nor Ju teaches performing unidirectional prediction, using only the temporally closest anchor frame, of a frame defined as a bi-directionally predicted frame, pages 11-14 of the remarks.

The examiner respectfully disagrees with that applicant. It is submitted that Igarashi teaches a forward prediction (fig. 17), unidirectional prediction, using a former frame, the temporally closest anchor frame, having odd and even fields to predict a current frame, the

current frame would obviously be P frame or B frame (bi-directional frame). Ju suggests B frames can contain macroblocks which are (a) intracoded, (b) unidirectional forward predictive coded, (c) unidirectional backward predictive coded using temporal encoding relative to a subsequent reference frame, **or (d)** bidirectionally predictive coded using temporal encoding relative to both previous and subsequent reference frames (col. 2, lines 20-25), which means unidirectional prediction, using only the temporally closest anchor frame, of a frame defined as a bi-directionally predicted frame. In view of the discussion above, the claimed features are unpatentable over the combination of Igarashi and Ju.

The applicant further pointed the board decision, page 13 of the remarks that is acknowledged.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See the previous Office Action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tung Vo whose telephone number is 571-272-7340. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on 571-272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Tung Vo
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